

and properly arranged to become admirable educational aids. In few, however, is there enough material to engage the whole time and attention of an able man in taking care of it; indeed a single month devoted to each of the departments of zoology, botany, geology, and so forth, would suffice, and, in many cases, more than suffice, to put each into working order to begin with, and after the first arrangement it would be easy enough to maintain the efficiency of each collection and to add what fresh acquisitions might be made in the course of a week's visit once a year.

Let, then, an association of the younger workers in the various branches of science be formed in London, under the direction of a committee of well-known names, and let it offer to send out every year for short intervals, to such museums as should be ready to pay for them, botanists, zoologists, geologists, and the rest, to name and arrange their several collections; each member so dispatched would then visit several museums in succession, confining his attention in each to the collection made in his own subject, and each museum would be visited by several members, one member for each of its essentially different collections. Thus for a slight expense (payment on the piece-work system) a large number of our Local Museums would be put under the curatorship of a group of specialists, and so be brought into efficient and permanent working order. The idea is simply that of visiting curatorships supplied on the principle of co-operation, and made possible by the facilities for travelling afforded by our modern railway system.

It can scarcely be doubted that in the summer, when lectures and lecturing are over, many scientific men might be found willing and able to undertake the task.

W. J. S.

Rainbow Reflected from Water

MR. CROOKES' interesting observation of the reflection of a rainbow—described in his letter in NATURE, August 16—is easily reproduced, on a small scale, experimentally.

I fixed a "spreader" to the nozzle of a garden-engine so as to cause a shower of fine drops of water to spread in the sunshine. The segments of a bright primary rainbow and of a rather subdued secondary one stood out well-defined against the dark foliage of some trees, the remainders of the bows being lost against bright objects and sky behind.

At whatever point the bows were visible, I found that by placing a mirror or blackened glass wetted so as to form a surface of water, in place of the eye, and then observing from a fresh point, the reflections of both bows could be very distinctly seen at the same time that real bows were also visible.

The reflected bows were always apparently smaller in diameter than the real bows which were visible at the same time from the same position. The reason of this, I presume, that the bows seen in the mirror are not the reflections of the bows visible, at the same time to the eye, but of bows which the eye would see if it occupied the place of the mirror, or rather of that portion of it which is observed. When, for instance, the mirror is one yard below the level of the eye, the drops by which the bows are formed that are reflected by the mirror, are necessarily about one yard below the corresponding drops by which the direct bows seen by the eye are formed; in other words the direct bows are one yard above the bows which are actually reflected. Therefore, when both are cut by a common horizontal line formed by the surface of the mirror, a reflected bow must be the more shortened of the two and its diameter apparently reduced.

I would suggest that this may be the explanation of the displacement of the colours where the real and reflected bows met, which Mr. Crookes observed.

ROBERT SABINE

Hampton Wick, August 20

The Greenland Föhn

DANS le dernier numero (406) de votre journal je vois que vous m'avez fait l'honneur de donner un abstract d'un petit travail sur le fœhn du Groenland. Malheureusement le rapporteur n'a pas bien compris le danois (ou le norwegien) en quelques endroits, et je me permettrai de vous indiquer les méprises suivantes comme les plus dangereuses.

2ième alinéa.—"Dr. Pfaff has carried on . . . and these show that the average temperature of February, 1872, was $-8^{\circ}7$ C., and of February, 1863 $-31^{\circ}6$," etc. Les deux mots, "February," sont omis, ce qui fait croire que je parle de la température moyenne de l'année au lieu d'un mois.

5ième alinéa.—"These explanations go a great . . . when

at Jacobshavn shortly before July, 9° C. of heat are recorded." Au lieu de "July" j'ai dit "Christmas"; une température de 9° C. est normale en juillet.

Août 21

W. HOFFMEYER

On the Supposed Action of Light on Combustion

IN answer to Mr. Watson's inquiry contained in your last number, I may state that at the meeting of the British Association at Exeter, in 1869, I read a paper under the above title (See *Phil. Mag.* for September, 1869), in which some comparative experiments were made on candles burning in full sunshine and also in a darkened closet. This mode of experiment was adopted because it allowed the results to be tested by weighing. Candles of the same make were used and hard sperm candles preferred as being less affected by variations of temperature than composite. The candles were allowed to burn during four hours. I give one result:—

In the dark (temp. 81° F.) each candle lost 544 grains, or 136 grains per hour.

In the light (temp. 84°) each candle lost 567 grains, or 142 grains per hour nearly.

It is evident that in this case the increase of temperature caused by the bright sunshine led to an increased consumption of material, but the general result was that light has no retarding influence on combustion.

C. TOMLINSON

Highgate, August 25

Evolution by Leaps

WITH reference to an article entitled "Evolution by Leaps," in your "Biological Notes" (NATURE, vol. xvi. p. 208), I would call attention to a fact which is not unknown to horticulturists, that a hybrid sometimes proclaims its origin by producing—even on the same rachis—flowers and fruits, some of which resemble one parent and some the other.

Many a time I have plucked a branch of two or three feet in length from a pear-tree growing in a village in Kent, which bore at the proximal end pears of a certain size and description, and on the terminal twigs pears smaller in size, of a different flavour, and later in blooming and ripening.

As this "sport" prevailed throughout the tree, which was large and flourishing, there was no possibility of its being the result of a direct graft.

PAUL HENRY STOKOE

Beddington Park

Zygæna Filipendulæ

IN July last I was breeding some *Zygæna filipendulæ* (six-spot Burnet moth) from pupæ taken in a chalk-pit near Cambridge, one of which was developed into a moth with five wings; four of these correspond to the normal wings in this species and are perfect in every respect, as also are five of the legs. The sixth leg (a hind leg) is absent, its place being filled up by the extra wing, which springs from the exact point at which the missing leg would naturally join the body. In appearance the extra wing resembles the ordinary hind wing of the species, but is only about half its usual size. It is of a yellowish-red tinge, and not so thickly covered with scales as the other wings of the insect. Of the sixth leg there is no external trace whatever, as far as I can see; in fact it would seem at first sight as if the leg had, by some means or other, been transformed into a wing.

This moth is subject to a good deal of variation as regards the size of the spots on the fore-wings, two of which are occasionally united; also, in this particular locality, the red colour is replaced by yellow in about 1 per cent. of the specimens. The chalk-pit to which I have alluded is scarcely an acre in extent, and as the species does not seem to occur elsewhere in the immediate neighbourhood, continuous interbreeding must have been going on for a long time.

I have never met with or heard of such a curiosity of morphology either in this or any other lepidopterous species before, but some of your readers will doubtless be able to adduce other instances of a similar nature.

N. M. RICHARDSON

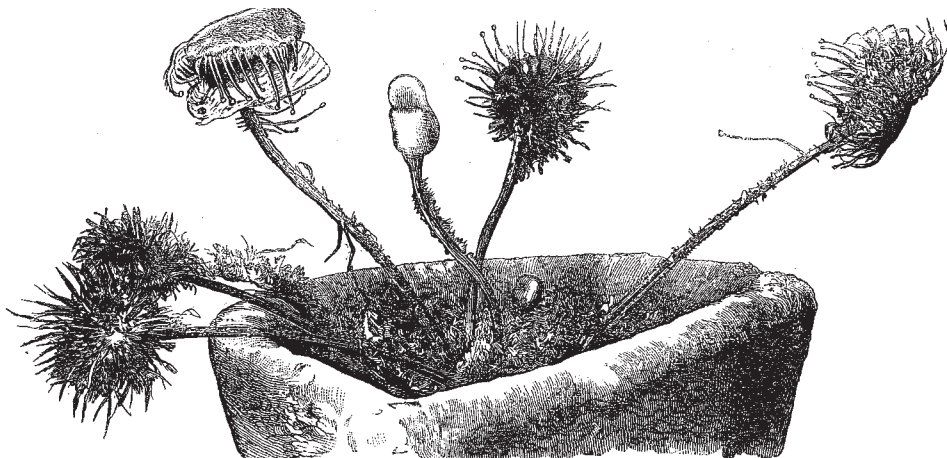
Clare College, Cambridge, August 21

Drosera

I BEG to enclose a photograph of a specimen of *Drosera rotundifolia* found by me at the Lickey Hills on July 1 this year.

If anything could demonstrate the propensity for fly-catching known to exist in this class of plants, surely this specimen does

in the most marked degree. You will see that a moth has been entangled by the hairs of one of the leaves, which leaf has curved



itself right over the moth in the most determined fashion. There is every appearance of a struggle having taken place which ended in the defeat and destruction of the moth.

This specimen is, I should imagine, a very typical one, and as such I have sent a copy to Mr. Darwin. WRIGHT, WILSON
Birmingham

The Radiant Centre of the Perseids

FROM twenty meteors, mostly with streaks, I deduced the radiant point at R.A. 40° , Dec. 56° N., August 3-7. On August 10 I saw a large number (fifty-seven per hour) of *Perseids*, many of them with short tracks near the focus, and almost invariably with streaks, from $43^\circ + 58^\circ$. On August 12 I observed quite an outburst of precisely similar meteors from a sharply-defined centre at $50^\circ + 55^\circ$, and registered fourteen of them, but many others were noted between 12h. and 14h. On the 16th, between the same hours, I saw five paths close to a radiant at $60^\circ + 59^\circ$. These had streaks and apparently exhibited the same features of motion, colour, &c., as those recorded on the few preceding nights. Can these four positions represent one and the same system of *Perseids* with an apparent displacement of the radiant centre on the several nights of observation? The places may be regarded as accurate for the dates, and though quite possibly they are separate showers, it is at least singular they became so well marked one on each night. If the positions include the same system then the focus of divergence appears to have shifted from $40^\circ + 58^\circ$ on the 3rd-7th to $60^\circ + 59^\circ$ on the 16th, so that while the declination remained nearly the same the R.A. had advanced twenty degrees, which in D. 59° N. is equivalent to ten linear degrees of space.

It is a capital plan while observing and mapping meteor tracks to hold a perfectly straight rod in the hand, and directly a meteor is seen, to project the rod upon its apparent path, carrying the eye back in the same line of motion and noting the exact point with reference to stars upon which it converges. In the case of slow meteors or meteors with streaks, this is a very accurate method and especially to be recommended in regard to paths presumably a long way from the radiant. Eye-estimates are necessarily less exact, for while the *position* of the track is being noted the more important feature of *direction* is inaccurately remembered.

W. F. DENNING

August 17

Fish Commensals of Medusæ

IN the numbers of NATURE for July 19 and 26 (pp. 227, 248) are communications respecting fish-sheltering Medusæ. The *Trochurus* in Europe appears to be a commensal of the *Acaleph* as well as the *Pollochi*. In the eastern waters of the United States, however, so far as I am aware, the Stromatoid fish *Poronotus similis* (*Stromateus similis* of some authors) seems to be the most common, if not the only associate, of several *acalephs*, viz., *Dactylometra quinquecirra*, *Zygodactylon grandilica*, and *Cyanea arctica*. Under the umbrellas of these species small *Poronoti* are to be found in the late summer swimming, sometimes even to the number of twenty or more, but generally much fewer. Mr. Alexander Agassiz, in his "Sea-side Studies,"

mentions the occurrence of an undetermined "*Clupeoid*" fish, but no other, under the umbrella of *Dactylometra quinquecirra*; the identification is probably erroneous. At least my own observations were made in the same region and at the same time of the year as Mr. Agassiz's, and only the *Poronotus* was seen. More detailed information respecting this association may be found recorded by Prof. Verrill in the "United States Commission of Fish and Fisheries" reports, Part I., pp. 449-450, 1873.

THEO. GILL

Smithsonian Institution, Washington, August 6

Science in Spain

I THINK it may interest the readers of your journal to have some slight idea of the state of natural sciences in Spain. Science is universal, and the efforts made by a nation which has been separated by centuries of intolerance and indifference from the movement and scientific life of other countries, cannot fail to be looked upon with indulgent eyes by those who cultivate science.

Of the three great branches into which we may divide natural science—physics, chemistry, and natural history, the first is in a most backward state in Spain. In almost all the professorships where this science is taught, the instruction given is so out of date, that no mention is made of the modern theory of the correlation of forces or thermo-dynamics, and the text-books used are French works, now quite obsolete. In every one of our upper schools—*Institutos de 2da Ensiñanza*—there is a professor who teaches physics and chemistry conjointly, who is instructed to go through a course of these sciences, which are reduced by this means to their lowest possible expression. In our universities, there exist classes in which an amplification of physics is taught; this study is part of those required for the preparatory exercises for the faculty of medicine. This course, if we take into consideration the knowledge brought by the pupils who attend it, is more an explanation of what they ought to have learnt than anything else. At the Madrid University alone, there is a class of "*imponderable fluids*;" the name in itself suggests an idea quite out of date at the present day. At the same university there is also a class of mathematical physics, but it does not form part of the studies required to receive a doctor's degree in the physico-chemical sciences, and is only included in the mathematical sciences. This is unfortunately all the official instruction on the subject which is given in Spain. Almost all the professors follow the theories which were generally admitted before the discoveries of Grove, Mayer, Rankine, Clausius, Tyndall, and Helmholtz.

During the Republican Government in Spain, it was decreed to reorganise these studies in a manner more in accordance with modern ideas, but the short rule of this reforming government prevented this plan from being carried out, or conquering the